CONTROLLED BURNING FROM AIRCRAFT

by G.B. Peet

Introduction

In recent months controlled burning from aircraft has received publicity here and in the Eastern States. This project received considerable backing from the Forests Department, and other authorities are expressing interest in the method.

The method was developed by C.S.I.R.O.'s Bushfire Research Section, and with the assistance and enthusiasm of Shannon and Nannup Divisions considerable progress in development of the technique was achieved last spring. With further experimentation the method has excellent possibilities of developing into a valuable means of lighting area controlled burning.

After the experiences of last spring C.S.I.R.O. are devoting considerable effort to improving the incendiary and ground marking apparatus. A similar effort will be required from Divisional and Fire Control Staff in preliminary planning and preparation of areas, if the method is to prove a success.

Some of the requirements of preparation and planning of aircraft burns are discussed here, together with aspects of technique and apparatus of general interest.

Aircraft

The aircraft selected for incendiary dropping is a Cessna 337. This is a high-winged, push-pull, twin engined type, with a safe minimum cruising speed of about 100 knots.

The cabin holds six seats of which the two middle ones are removed to hold the incendiary apparatus.

The purchase cost of this aircraft is about $50,000 and the hire rate is $50 per hour.

The cost of lighting, which includes aircraft hire and incendiaries, approximated 7½ cents per acre last spring. With stand-by delays from poor burning weather this cost could easily double.

D.C.A. regulations covering this operation have been compiled. These cover choice of pilot, communications and flying restrictions.

Incendiary Apparatus

The incendiary apparatus is fixed to a metal frame connected to the left hand middle seat-runners. The frame holds a tank of ethylene glycol connected to a syringe and an electric timer. The electric timer is set to the required spot fire distance and activates a metal plate at a set time interval. This is the signal to eject the primed incendiary down a tube passing through the base of the aircraft.

The incendiaries consist of a plastic tube 1½ inches in length and one inch

in diameter. This tube holds 5 grammes of potassium permanganate and three fusee matches.

To prime the incendiary 1½ mls. of ethylene glycol is enjedted into the tube from the syringe. This mixes with the potassium permanganate and produces an intense heat reaction after about 20 seconds. The reaction ignites the fusees which in turn light the plastic tube and the whole burns for about two minutes. The reaction time is ample to allow the incendiary to reach the ground before lighting.

Mr. Packham of C.S.I.R.O. who designed this apparatus is at present working on a semi-automated model to eliminate part of the hand priming and handling of incendiaries.

Aircraft Crew

The aircraft crew consists of the pilot, observer, bombardier and controller. In brief their duties are:

(a) Pilot. Responsible for aircraft safety, maintenance and flying techniques.

(b) Observer. Assists the pilot with gyro corrections for maintaining his flight paths and stops and starts the bombing.

(c) Bombardier. Operation and maintenance of incendiary apparatus.

(d) Controller. Assists the bombardier and controls the operation with the air to ground wireless link.

Divisional staff have been used in both the controller and bombardier positions.

Ground Marking

The term "flight lines" corresponds here with normal lighting strips. The start point of each flight line is marked on the ground with something visible to the pilot. In the past hydrogen filled balloons were used but these are difficult to manage and frequently burst. Flares appear more promising.

Mr. Packham is working on an A.D.F. system for grcund marking. This consists basically of a small transmitter on the ground on which the aircraft homes with its radio wave direction finding apparatus.

The flight lines last spring were flown into the wind and areas were lit in two parts. (refer "West Australian" report). This method created problems in visability and turbulence from smoke. Attempts were made this autumn to fly the lines across wind, and if this can be developed it should produce a more satisfactory method of lighting. The main problem in flying across wind is determining the amount of drift in the flight line from varying wind velocity.

Prior Preparation

On 10 chain wide flight lines the aircraft will light at a rate of about 3000 acres per hour and cover approximately 10,000 acres per day with time for the spot fires to burn out. These rates provide ample warning of the degree of planning and preparation required to keep these burns under control.

(a) Tracks

Boundary tracks around areas proposed for aircraft burning must be trafficable. This is essential for rapid movement of suppression forces and to allow markers to change position quickly. It is pointless including areas for aircraft burning where this requirement cannot be fulfilled.

(b) Edging

The rapid rate of lighting makes prior effective edging a necessity. Moving the aircraft from Division to Division is costly as separate organisations have to be set up, and there are high stand-by costs on the aircraft. It is desirable that any one Division prepare for several continuous days of lighting without major problems from escapes. Both Shannon and Nannup have already demonstrated that this is possible, even in difficult forest types.

(c) Flight Plans

Each area for aircraft burning requires a flight plan. This shows the equivalent track distances that markers must move to maintain 10 chain widths between the flight lines.

Flight lines of less than 10 chains in width may be difficult to maintain except over short distances because of flying problems in maintaining direction within very fine limits. It follows then that areas selected for aircraft burning should be capable of accepting the Green or Blue scorch height specification shown in the controlled burning guide.

In general flight plans should be prepared for Easterly and Southerly winds, orientating the flight lines across the wind. These plans are prepared by marking the flight lines on a plan and measuring the equivalent track distance. The start point of each flight line is marked on the ground. The first marking point will be 10 chains equivalent distance from the downwind flank of the area, and thereafter moves will be at 20 chain equivalent distances. The opposite marker will move at 20 chain equivalent distances. This procedure is explained on figure 1 on the following page.

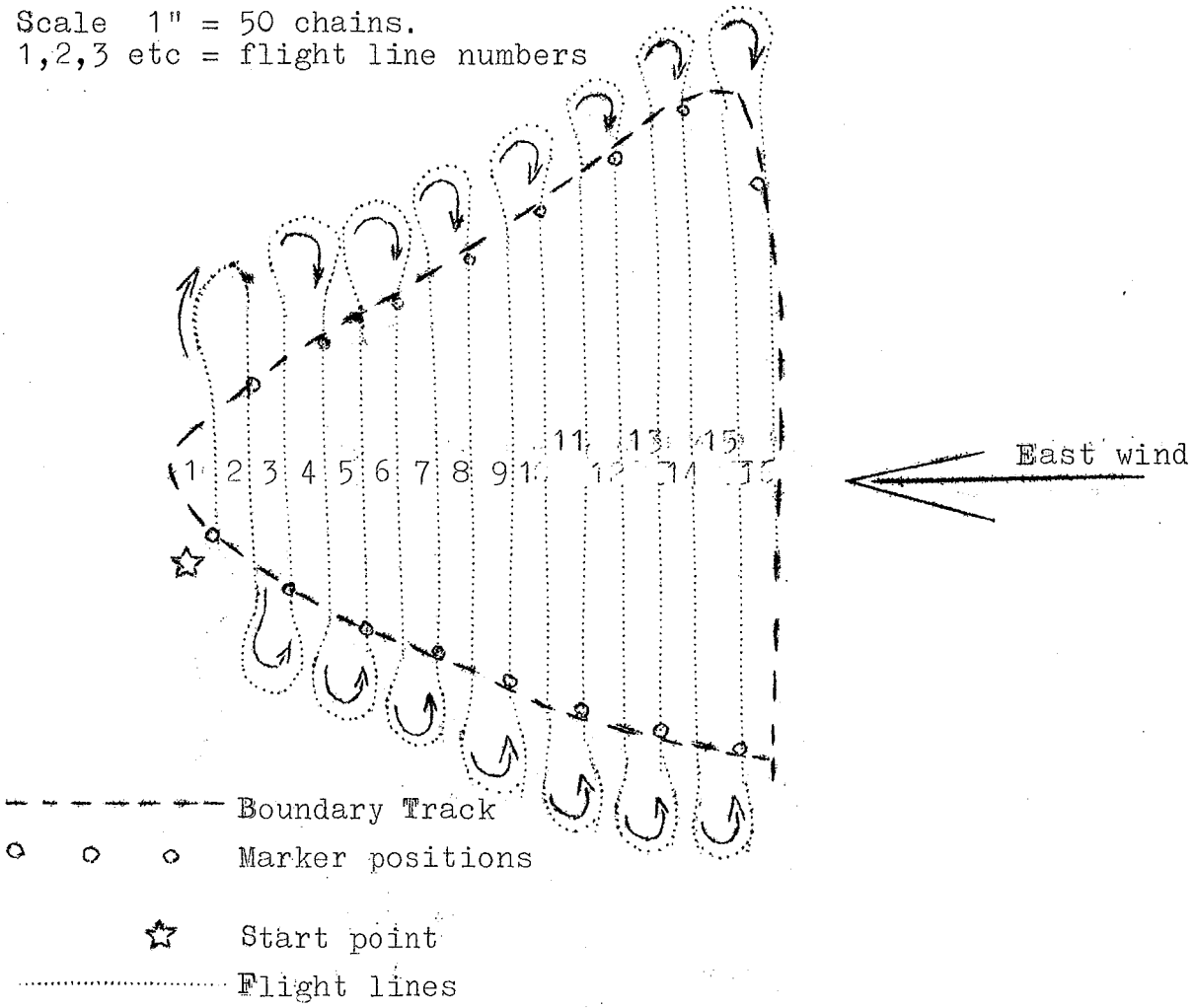
(d) Inspection

Normal prior inspection reports are required for aircraft burning. It is important to ensure that litter cover is complete. The incendiaries cannot be placed at the best point for lighting and uniform and complete fuel is required for an adequate take of spot fires.

(e) Personnel and Stores

Aircraft fuel, oil and pump should be at the airstrip from which the aircraft will operate. It is desirable to hold incendiaries and marking equipment at Divisional headquarters to minimise delay when moving from one area to another.

Divisional staff must be fully trained in aircraft procedures, especially the markers and crew members. The local organization must be geared to move quickly once the aircraft arrives, as delays result in high hire costs and patchy burns.



Comment

Although the requirements of aircraft burning may appear arduous the method shows considerable promise. In some areas it appears to be the only practical method of implementing and maintaining rotational controlled burning regimes. Some requirements may alter as techniques develop but the principles of planning and preparation are unlikely to change markedly.